

ABSTRACT OF THE DISCLOSURE

A method described for making a semiconductor transistor having a thin gate dielectric layer with a high k-value but without any impurities in a channel in silicon directly below the gate dielectric layer. An apparatus is used which pulses a cathode to create a plasma generating voltage potential between the cathode and an anode provided by a wall of a chamber of the apparatus. The plasma generating voltage generates an ion plasma out of a gas in the chamber. The ion plasma is maintained transient which allows for better control of its energy. A portion of a wafer stand is pulsed with a small voltage which extracts and accelerates ions out of the plasma into a silicon dioxide gate dielectric layer formed on a wafer in the chamber.